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IS 288 (1981): Arsenical copper rods for boiler stay bolts and rivets [MTD 8: Copper and Copper Alloys]



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Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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IS : 288-1981
(Reaffirmed 1996)

REAFFIRMED 2006

Indian Standard

**SPECIFICATION FOR
ARSENICAL COPPER RODS FOR
BOILER STAY BOLTS AND RIVETS**

(*Second Revision*)

Second Reprint OCTOBER 2000

UDC 669.35 '778- 422 :621.882.63 + 621.884:621.133

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Gr 2

September 1981

IS : 288 -1981
(Reaffirmed 1996)

Indian Standard
SPECIFICATION FOR
ARSENICAL COPPER RODS FOR
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(*Second Revision*)

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**AMENDMENT NO. 1 JUNE 2004
TO
IS 288 : 1981 SPECIFICATION FOR
ARSENICAL COPPER RODS FOR BOILER STAY
BOLTS AND RIVETS**

(Second Revision)

(Page 3, clause 2.0, line 2) — Substitute 'IS 3288 (Part 3) : 1986†' for 'IS : 3288 (Part I)-1981†'.

(Page 3, footnote marked '†') — Substitute the following for the existing footnote:

†Glossary of terms relating to copper and copper alloys : Part 3 Wrought forms.'

(Page 4, clause 3.1, line 2) — Substitute 'IS 1387 : 1993*' for 'IS : 1387-1967*'. *

(Page 4, footnote marked '*') — Substitute the following for the existing:

*General requirements for the supply of metallurgical materials (second revision).'

(Page 4, clause 6.1, line 1) — Substitute 'IS 1608:1995‡' for 'IS : 2654 - 1964‡'.

(Page 4, footnote marked '‡') — Substitute the following for the existing footnote:

‡Mechanical testing of metals – Tensile testing (second revision).'

(Page 5, clause 9.1) — Substitute 'IS 2826 : 1986*' for 'IS : 2826 - 1980*'. *

(Page 5, footnote marked '*') — Substitute the following for the existing footnote:

*Dimensions and tolerances for copper and copper alloys, rods and bars for general engineering purposes (third revision).'

(MTD 8)

Reprography Unit, BIS, New Delhi, India

Indian Standard
SPECIFICATION FOR
ARSENICAL COPPER RODS FOR
BOILER STAY BOLTS AND RIVETS
(*Second Revision*)

0. FOREWORD

0.1 This Indian Standard (Second Revision) was adopted by the Indian Standards Institution on 29 May 1981, after the draft finalized by the Copper and Copper Alloys Sectional Committee had been approved by the Structural and Metals Division Council.

0.2 This standard was first issued in 1951 and subsequently revised in 1960. This standard specifies the requirements for copper suitable for the manufacture of stay bolts, rivets, etc, for locomotive boilers. The same material is also suitable for stay bolts of marine and land boilers, of both the fire-tube and water-tubes types. In this revision, the table on tensile properties has been modified and a clause on bend test altered.

0.3 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS: 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard covers the requirements of arsenical copper rods of size 10 mm and above for locomotive boiler stay bolts, rivets, etc;

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definition as given in IS : 3288 (Part I)-1981† shall apply.

*Rules for rounding off numerical values (*revised*).

†Glossary of terms for copper and copper alloys: Part I Cast form and wrought form (main types) (*second revision*).

IS : 288 - 1981

2.1 Bar/Rod — Any extruded, drawn, cold or hot rolled, forged, cast or combination of any of these processes of solid section supplied in straight length, whose width or greatest distance between parallel faces is greater than 6 mm.

3. GENERAL REQUIREMENTS

3.1 General requirements, relating to the supply of material shall conform to IS : 1387-1967*.

4. CONDITIONS

4.1 The rods shall be supplied in annealed or as manufactured condition (*see* Table 2).

4.2 The rods shall be supplied in lengths as agreed to between the manufacturer and the purchaser.

5. CHEMICAL COMPOSITION

5.1 The chemical composition of the material, when analysed in accordance with IS : 440-1964†, shall be as specified in Table 1. The method for determination of oxygen shall be as agreed to between the supplier and the purchaser.

TABLE 1 CHEMICAL COMPOSITION

CONSTITUENT	PERCENT
Copper + Silver, <i>Min</i>	99.20
Arsenic	0.20 to 0.50
Antimony, <i>Max</i>	0.05
Bismuth, <i>Max</i>	0.002
Oxygen, <i>Max</i>	0.10
Lead, <i>Max</i>	0.01

6. PHYSICAL PROPERTIES

6.1 Tensile Test — The material, when tested in accordance with IS : 2654-1964‡ shall have the tensile properties as given in Table 2.

6.2 Bend Test — The test specimen in annealed condition and unmachined shall withstand being bent through 180° and closed flat on itself, both, when at red heat and in cold condition without showing crack or flaw.

*General requirements for the supply of metallurgical materials (*first revision*).

†Methods of chemical analysis of copper (*revised*).

‡Method for tensile testing of copper and copper alloys.

TABLE 2 TENSILE PROPERTIES

(Clause 4.1 and 6.1)

		DIAMETER	TENSILE STRENGTH	ELONGATION ON GAUGE LENGTH OF
		mm	MPa, <i>Min</i>	$5.65\sqrt{S_0}$, <i>Min</i>
Annealed	{	10 to 25	215	35
		Over 25 to 50	205	40
		Above 50	195	40
As manufactured	{	10 to 25	255	15
		Over 25 to 50	245	18
		Above 50	235	20

1 MPa = 0.102 kgf/mm².

6.3 Hammering or Crushing Test — A piece of rod 25 mm long in annealed condition shall be placed on an end and hammered with a single blow or crushed when cold to a thickness of 10 mm without showing either cracks or flaws on the circumference of resulting disc.

7. FRACTURE TEST

7.0 The object of the fracture test is to determine freedom from piping and other defects. The test shall be carried out as given in 7.1.

7.1 The character of the material shall be ascertained by examining the fractured sections obtained by breaking of small portion of the rod at both the ends after sawing the rod all round to a depth of not more than one-fourth of the diameter.

8. FREEDOM FROM DEFECTS

8.1 The rods shall be clean, smooth, uniform in diameter and free from piping or other defects of every description. Any material may subsequently be deemed not to comply with the standard due to faults in manufacture, notwithstanding that it has previously been shown to conform to the specified limits of chemical composition and has passed the mechanical tests.

9. SIZES AND TOLERANCES

9.1 The sizes and tolerances shall be as given in IS : 2826 - 1980*.

10. PACKING

10.1 Rods shall be supplied in bundles, weighing approximately 120 kg and strapped with wire.

*Dimension for wrought copper and copper alloy rod and bar for general engineering purposes (*second revision*).

IS : 288 - 1981

11. MARKING

11.1 Each rod shall be stamped, within 30 cm from either end, with the name, initials or trade-mark of the manufacturer, by which the manufacturer may be identified. In addition, a metal tag showing the size and mass of the material be suitably tacked to each bundle of the rods.

11.1.1 The material may also be marked with the Standard Mark.

NOTE — The use of the Standard Mark is governed by the provisions of the Bureau of Indian Standards Act, 1986 and the Rules and Regulations made thereunder. The Standard Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well defined system of inspection, testing and quality control which is devised and supervised by BIS and operated by the producer. Standard marked products are also continuously checked by BIS for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

12. SAMPLING

12.1 When tests are specifically called for by the purchaser, material (of the same size and temper) shall be grouped in batches as follows and one sample shall be selected from each batch or part thereof to provide the necessary test pieces :

<i>Specified Size Across Flats</i>	<i>Diameter or Width of Material</i>	<i>Mass of Each Batch</i>
Over mm	Up to and Including mm	kg
—	12	250
12	40	500
40	80	1 000
80	—	2 000

13. RETEST

13.1 Should any of the test pieces first selected fail in any of the prescribed tests, two further samples from the same batch shall be selected for testing, one of which shall be from the rod from which the original test sample was taken, unless the rod has been withdrawn by the supplier.

13.1.1 Should the test pieces from both these additional samples pass, the batch represented by the test samples shall be deemed to comply with this standard. In case the test pieces from either of these additional samples fail, the batch represented by the test samples shall be deemed not to comply with this standard.

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